REMARKS

Favorable reconsideration of this application in light of the preceding amendments and the following remarks is respectfully requested.

No claims having been cancelled or added, the Applicants respectfully submit that claims 1-37 remain pending in this application with claims 35-37 having been withdrawn from consideration in light of the Applicants' election in response to the Restriction Requirement previously imposed on this application.

The Applicants note with appreciation the Examiner's acknowledgement that certified copies of all priority documents have been received by the USPTO. Action Summary at 12.

The Applicants respectfully note that the present Action does not indicate that the drawings have been accepted by the Examiner. The Applicants request that the Examiner's next communication include an indication as to the acceptability of the filed drawings or as to any perceived deficiencies so that the Applicants may have a full and fair opportunity to submit appropriate amendments and/or corrections to the drawings.

The Applicants acknowledge their obligations under 37 C.F.R. § 1.56 with respect to ensuring that the inventorship accurately reflects the claims being prosecuted in the application. Action at 4. The Applicants submit, however, that no correction is warranted at this time.

Rejections Under 35 U.S.C. § 112

Claim 6 stands rejected under 35 U.S.C. § 112, second paragraph, as indefinite with respect to an antecedent basis for the claim term "the capping layer." The Applicants submit that the amendment to claim 6 reflected above, by which the

dependency of claim 6 is changed from claim 4 to claim 5, is sufficient to provide the necessary antecedent basis.

The Applicants, therefore, request that this rejection be reconsidered and withdrawn.

Rejections under 35 U.S.C. § 102

Claims 1, 5 and 10 stand rejected under 35 U.S.C. § 102(e) as anticipated by Amos et al.'s U.S. Patent No. 6,846,734 ("Amos"). The Applicants respectfully traverse this rejection for the reasons detailed below.

The Applicants submit that nothing teaching has been identified in Amos that suggests that "a nickel silicide layer having an upper layer and a lower layer, wherein the alloying metal is preferentially segregated in the upper layer" as recited in claim 1 was achieved or recognized by Amos. Indeed, the Applicants note that Amos provides a broad disclosure in which:

> Metal alloy layer 58 is the formed atop layer 56 and the exposed polysilicon layer, See FIG. 13. The metal alloy layer of the present invention comprises at least one metal, which is capable of reacting with the underlying polysilicon to form a silicide region and an alloy additive. The metal of the metal alloy layer employed in the present invention includes any of the metals listed above in connection with the first and second metals. Preferred metals for the metal alloy are ***Co or Ni, with Co being highly preferred***. The alloy layer of the present invention also include ***0.1 to 50 atomic %*** of at ***least one additive***, said at least one additive being selected from ***C, Al, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Ge, Zr, Nb, Mo, Ru, Rh, Pd, Ag, In, Sn, Hf, Ta, W, Re, Ir and Pt***, with the proviso that the alloy additive is not the same as the metal. Mixtures of one or more of these additives are also contemplated herein. More preferably, the additive is present in the alloy layer in an amount of from about ***0.1 to about 20 atomic %***. Of the above mentioned additives, ***Al, Ti, V, Ge, Zr, Nb, Ru, Rh, Ag, In, Sn, Ta, Re, Ir, and Pt*** are preferred in the present invention.
>
> * * *

> The first annealing step is typically carried out at a temperature of from about ***450° C. to about 600° C.*** for a time period of from about 1 to about 120 seconds. More preferably, the annealing step is typically performed at a temperature of from about ***500° C. to about 550° C.*** for a time period of from about 20 to about 90 seconds. Note that other temperatures and times may be employed as long as the conditions are capable of causing the formation of silicide regions. The first annealing step is typically carried out in a gas ambient that includes He, Ar, N_2 or a forming gas.

Amos, col. 9, lines 10-29 and col. 10, lines 4-14 (emphasis added).

The Applicants note that the mere fact that a certain result or characteristic may occur or be present in some combination of the prior art disclosure is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993). Indeed, in order to establish inherency, a disclosure must make clear that the missing element would necessarily be present and that it would be so recognized as such by persons of ordinary skill. Inherency is not, however, established by mere probabilities or possibilities. *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). As in this instance, the disclosure of a broad range of possibilities or a genus, without any guidance or teaching sufficient to lead one skilled in the art to the claimed invention does not "inherently" disclose any specific combination of the various elements or a species that provides unexpected results, but merely invites further experimentation. *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1367 (Fed. Cir. 2004).

In this instance, Amos does not teach or suggest any particular combination of materials and conditions that would necessarily produce the segregation of the alloying metal as required by the claim to form the recited two-layer structure. Indeed, one skilled in the art "guided" by Amos would have to reject Amos' "highly preferred" Co in favor of Ni, select an appropriate alloying material or materials from Amos' list of "C, Al, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Ge, Zr, Nb, Mo, Ru, Rh, Pd, Ag, In, Sn, Hf, Ta, W, Re, Ir and Pt," determine an appropriate concentration between "0.1 to 50 atomic %" and find a satisfactory thermal profile for the silicidation process that will provide the recited

structure two-layer silicide layer that the person skilled in the art would not have appreciated was possible.

The Applicants submit that suggesting that one skilled in the art could or would successfully make the specific "selections" necessary to achieve the claimed result while guided only by the generic teachings of Amos is a fiction wholly inconsistent with present reliance on "inherency." Indeed, the Applicants contend that the logical extension of the Examiner's "inherency" theory would effectively bar the submission of unexpected results for illustrating that some particular portion of previously disclosed range provided "unexpected results." Because the use of Rule 132 Declarations for submitting comparative test data for overcoming prior art rejections remains alive and well, the Applicants contend the "inherency" theory is being improperly applied in this instance.

The Applicants note that the only example provided by Amos utilized a metal layer of Co with Sn as the alloying metal. The Applicants further note that the teachings provided by Amos focus on the alloying materials and/or the use of bilayers for controlling or tuning the threshold voltages of associated MOSFETs. The Applicants contend, therefore, that one skilled in the art and guided by Amos seeking to obtain a two-layer structure would adopt the "bilayer" approach using two separate depositions rather than attempting to achieve segregation of the primary metal and alloying metals.

The Applicants contend that given the failure of Amos to recognize that a two-layer structure could be obtained through segregation of the primary and alloying metals during silicidation, Amos cannot fairly be said to provide any guidance to one of ordinary skill in the art for designing an experimental program for determining which particular combinations could achieve such a result. Thus, the Applicants contend that the Examiner's assertion that "such a process would occur in the Amos et al. reference based upon the processes conducted," Action at 3, conveniently ignores the plain teachings of Amos and the lack of any specific teaching as to the selection of those "processes" that would necessarily achieve the claimed structure. Simply alleging that some random

combination of the disclosed elements might accidentally reproduce the claimed method does not constitute the required showing of "a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (B.P.A.I. 1990).

Accordingly, the Applicants request that this rejection be reconsidered and withdrawn.

Claims 1, 15, 21, 25, 31 and 32 stand rejected under 35 U.S.C. § 102(e) as anticipated by Paton et al.'s U.S. Patent No. 6,797,614 ("Paton"). The Applicants traverse this rejection for the reasons detailed below.

The Applicants incorporate the discussion above with regard to the requirements of a valid application of "inherency" to support a rejection in light of prior art teachings. In this instance, the Applicants note that Paton, like Amos, broadly discloses ranges of materials and processes in connection with a silicidation process, but that Paton, again like Amos, does not teach or suggest that segregation of the primary metal and the alloying metal may be achieved, is in any way desirable, or even that such an occurence is possible.

The Applicants note that Paton is directed to a method of suppressing the formation of germanosilicides that may result from the presence of germanium atoms in a strained silicon lattice through the incorporation of an alloying metal, specifically vanadium, tungsten and tantalum. Paton, col. 2, lines 31-50. The Applicants note that Paton provides for a silicidation temperature in the range of 400-600° C., Paton, col. 5, lines 63-65, and apparently tolerates a wide range of alloy compositions, *i.e.*, 1-30%, Paton, col. 5, lines 23-26. The Applicants also note that Paton, like Amos, provides for an alternative bilayer structure in which the primary metal and the alloying metal are

deposited separately and then combined at, for example 400-700° C., Paton, col. 5, lines 37-55.

The Applicants contend, therefore, that because Paton is apparently relying on the presence of the alloying metal at or near the interface with the silicon/germanium surface to suppress formation of germanosilicides, segregation of the majority of the alloying metal into a more distant layer would be a highly undesirable result. Accordingly, the Applicants contend that had Paton observed such segregation (resulting in a structure that may correspond in some respects to Paton's "bilayer" embodiment), the thermal process would be modified to include an annealing step sufficient to suppress or eliminate such segregation and thereby achieve the desired "combined" layer. Paton, col. 5, lines 37-55. Given the lack of any such discussion in Paton, the Applicants contend that no such segregation occurred under the processes employed by Paton and that no remedial action was required as a result.

In light of Paton's disclosure, the Applicants contend that no portion of Paton has been shown to teach or suggest that any of the combinations of composition and temperature contemplated by Paton produced the claimed two-layer structure. Indeed, the Applicants contend that Paton plainly teaches that rather than such segregation occurring, Paton, col. 5, lines 37-55, the recommended thermal processes will tend to form an alloy layer from adjacent layers of a primary and an alloying metal.

Accordingly, the Applicants contend that Paton teaches that the segregation required to obtain the structure recited in the pending claims will not occur at the concentrations and temperatures deemed suitable by Paton. The Applicants contend that it is improper to maintain an "inherency" argument that suggests a result directly contrary to that achieved by the disclosed method. To the extent that the parameters necessary to achieve the recited step of forming a "nickel silicide layer having an upper layer and a lower layer" according to claim 1 could be encompassed by Paton's broad disclosure, the Applicants maintain that Paton provides no suggestion that such a result is possible or even how to go about determining what combination of parameters would be successful in achieving such a result.

Absent such teachings, the Applicants maintain that Paton cannot fairly be said to anticipate, *i.e.*, disclose every limitation as recited in the claims, because one skilled in the art would received no guidance regarding the selection from among the many possible combinations and would, therefore, have no reasonable expectation of obtaining a method that could achieve the recited two-layer nickel silicide structure resulting from nickel alloy segregation during the formation of the silicide.

Accordingly, the Applicants request that this rejection be reconsidered and withdrawn.

Rejections under 35 U.S.C. § 103

Claims 2-4, 6-9 and 11-14 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Amos. The Applicants respectfully traverse this rejection for the reasons detailed below.

The Applicants incorporate herein the discussion above regarding the breadth of the Amos disclosure and its absolute silence as to the formation of a two-layer structure by inducing segregation of a primary metal and an alloying metal during formation of a silicide. With respect to the Examiner's contention regarding "routine experimentation" for determining the "optimum relative thicknesses," the Applicants note that only "result-effective" parameters, *i.e.*, those parameters which correlate to a recognized result, may be optimized through "routine experimentation." *In re Antonie*, 559 F.2d 618 (CCPA 1977).

The Applicants submit, therefore, that because there is no evidence on the record that the prior art even recognized the presence of the two-layer silicide structure achieved by the invention, let alone correlated the presence of this structure with any desirable device parameters, the ratio of the two layers cannot fairly be characterized as "result-effective" parameter or variable. With respect to the composition ranges, the Applicants again contend that the failure of the prior art to produce and/or recognize the two-layer silicide structure achieved by the invention, the compositions and process conditions

necessary to achieve such a result cannot fairly be said to be "result-effective" parameters. The Applicants, therefore, maintain that the application of the "routine experimentation" rationale, Action at 5, to remedy the deficiencies of Amos is improper absent a showing that the parameters being "optimized" were previously recognized as "result-effective" parameters.

Accordingly, the Applicants request that this rejection be reconsidered and withdrawn.

Claims 2-4, 7-9 and 16-18, 26, 28-30, 33 and 34 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Paton. The Applicants respectfully traverse this rejection for the reasons detailed below.

The Applicants incorporate herein the discussion above regarding the breadth of the Paton disclosure and its absolute silence as to the formation of a two-layer structure by inducing segregation of a primary metal and an alloying metal during formation of a silicide. With respect to the Examiner's contention regarding "routine experimentation" regarding the "optimum relative thickness" based upon a variety of factors including sheet resistance, Action at 6, the Applicants again note that only "result-effective" parameters, *i.e.*, those parameters which correlate to a recognized result, may be optimized through "routine experimentation." *In re Antonie*, 559 F.2d 618 (CCPA 1977).

The Applicants submit, therefore, that because there is no evidence on the record that the prior art even recognized the presence of the two-layer silicide structure achieved by the invention, let alone correlated the presence of this structure with any desirable device parameters, including sheet resistance, the ratio of the two layers cannot fairly be characterized as "result-effective" parameter or variable. The Applicants, therefore, maintain that the application of the "routine experimentation" rationale, Action at 6, to remedy the deficiencies of Amos is improper absent a showing that the parameters being "optimized" were previously recognized as "result-effective" parameters.

Accordingly, the Applicants request that this rejection be reconsidered and withdrawn.

Claims 5, 6, 10-14, 19, 20 and 27 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Paton in view of Amos. The Applicants respectfully traverse this rejection for the reasons detailed below.

The Applicants incorporate herein the discussion above regarding the breadth of the Paton and Amos disclosures and their absolute silence as to the formation of a two-layer structure by inducing segregation of a primary metal and an alloying metal during formation of a silicide. The Applicants contend that the proposed addition of Amos does not remedy the noted deficiencies in the Paton disclosure with respect to the basic elements of the claimed methods.

Accordingly, the Applicants request that this rejection be reconsidered and withdrawn.

Claims 22-24 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Paton in view of Chittipeddi et al.'s U.S. Patent No. 6,498,080 ("Chittipeddi"). The Applicants respectfully traverse this rejection for the reasons detailed below.

The Applicants incorporate herein the discussion above regarding the breadth of the Paton disclosure and its absolute silence as to the formation of a two-layer structure by inducing segregation of a primary metal and an alloying metal during formation of a silicide. The Applicants contend that the proposed addition of Chittipeddi does not remedy the noted deficiencies in the Paton disclosure with respect to the basic elements of the claimed methods.

Accordingly, the Applicants request that this rejection be reconsidered and withdrawn.

The Applicants also contend that the formation of the two-layer silicide structure is an "unexpected result" in light of the failure of art of record to provide any teaching or suggestion that such a result can be obtained at all, or that such a result could be obtained for any specific range of nickel alloys by subjecting them to specific thermal treatments. Absent such teachings, the Applicants contend that the compositions and process conditions necessary to obtain basic silicide structure produced by the recited process could not be predicted, let predicted with reasonable confidence. Accordingly, the Applicants maintain that the claimed methods are not taught or suggested by any of the applied references, whether considered singly or in combination and are, therefore, patentable over the applied references.

CONCLUSION

In view of the above remarks and amendments, the Applicants respectfully submit that each of the pending objections and rejections have been addressed and overcome, leaving the present application in condition for allowance. A notice to that effect is respectfully requested.

If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to contact the undersigned.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge any underpayment or non-payment of any fees required under 37 C.F.R. §§ 1.16 or 1.17, or credit any overpayment of such fees, to Deposit Account No. 08-0750, including, in particular, extension of time fees.

Respectfully submitted,

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